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(54) IMPROVEMENTS IN OR RELATING TO THE PREPARATION OF ALLOYS

(71) We, STANDARD TELEPHONES AND CABLES LIMITED, a British Company, of 190 Strand, London, W.C.2, England, do hereby declare the invention, for which we pray that a patent may be granted to us, and the method by which it is to be performed, to be particularly described in and by the following statement:—

This invention relates to the preparation of alloys, and in particular to the preparation, in powder form, of alloys suitable for forming the electrodes of monolithic ceramic capacitors.

Monolithic ceramic capacitors are made with alternate layers of ceramic dielectric and metal electrodes. The electrodes are produced by printing with a fine metal powder ink and the ceramic is then fired generally at temperatures in excess of 1250°C. As the electrode metal must be resistant to oxidation at these temperatures, the choice of material has so far been restricted to the expensive precious metals platinum and palladium and their alloys with silver and gold.

Some nickel alloys are suitable as electrode materials, but their preparation in the necessary powder form has previously involved melting the component metals followed by some subsequent comminution process.

According to the invention there is provided a process for preparing a metal alloy powder, including coating particles of a first each with a layer of a second metal by electroless deposition of the second metal from solution, washing and drying the coated particles, and heating the coated particles in a current of argon in a fluidised bed to a temperature sufficient for the first and second metals to interdiffuse to form an alloy.

Embodiments of the invention will now be described with reference to the accompanying drawing in which

Fig. 1 shows a fluidised bed arrangement for heat conditioning metal powders, and

Fig. 2 shows a monolithic capacitor in cross section.

The alloy powders are prepared by electroless coating of a metal powder. Fine nickel powders, for example, are readily available and can be electroless coated with such metals as copper, silver, palladium, platinum or gold, simply by mixing the powder with a suitable plating solution containing the metal ion. The coated powder is then washed and dried, and the coating metal is interdiffused with the metal core to form an alloy by heating the powder in a fluidised bed arrangement such as is shown in Fig. 1. The powder 11 is placed in a bath 12 fitted with a porous base 13 through which hot argon is blown to fluidise and heat the powder, thus preventing agglomeration of the particles during the alloying process. The powder is then heated in fluidised form in the bath in the inert argon atmosphere for a sufficient period of time, and at a sufficient temperature, for the metals of each particle to diffuse to form the alloy without an intermediate melting stage. In some applications further coatings may similarly be applied and diffused in.

In a further application this process may be employed to prepare metal alloy powders suitable for use as inks in magnetic printing processes.

The monolithic capacitor shown in Fig. 2 includes metallic electrodes 22 formed from an alloy powder of the type described herein. The capacitor is formed by firing at temperatures above 1250°C in an atmosphere of carbon dioxide. Electrical contact to the electrodes is effected via conductive end terminations 23 which may be fired on to the capacitor after the ceramic has been fired. In some applications atmospheres other than carbon dioxide may be employed. Thus, depending on the particular ceramic and electrode materials employed the capacitors may be fired in atmospheres such as argon, nitrogen, hydrogen or mixtures thereof, or in vacuum.

WHAT WE CLAIM IS:—

1. A process for preparing a metal alloy powder, including coating particles of a first metal each with a layer of a second metal

by electroless deposition of the second metal from solution, washing and drying the coated particles, and heating the coated particles in a current of argon in a fluidised bed to a temperature sufficient for the first and second metals to interdiffuse to form an alloy.

2. A process as claimed in claim 1, and in which the first metal is nickel.

3. A process as claimed in claim 1 or 2, and in which the second metal is copper.

4. A process for preparing a metal alloy powder substantially as described herein with reference to Fig. 1 of the accompanying drawing.

5. A monolithic ceramic capacitor provided with electrodes formed from an alloy powder as claimed in any one of claims 1 to 4.

6. A metal alloy powder prepared by the method of any one of claims 1 to 4.

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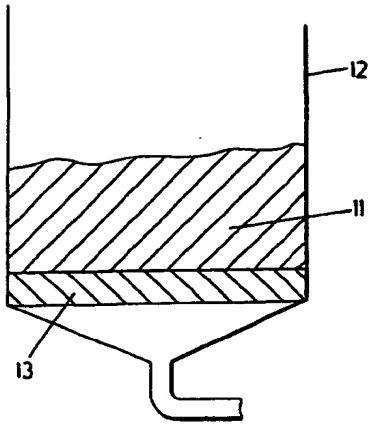
COMPLETE SPECIFICATION

This drawing is a reproduction of the Original on a reduced scale



FIG·1

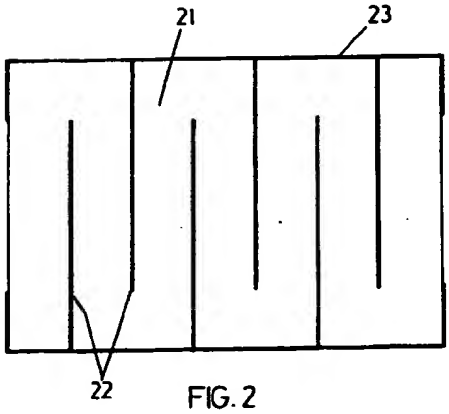


FIG. 2